

PATENT SPECIFICATION

(11) 1 299 009

DRAWINGS ATTACHED

(21) Application No. 59795/70 (22) Filed 16 Dec. 1970

(45) Complete Specification published 6 Dec. 1972

(51) International Classification A23B 7/06 A23L 3/16

(52) Index at acceptance

A2D 2E1 2E2 2F 3B

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(54) PROCESS FOR THE MANUFACTURE OF PACKS CONTAINING PRE-COOKED POTATOES

(71) We, HAUPT - GENOSSEN-
SCHAFT eGmbH, a Body Corporate
organised under the laws of the Federal
Republic of Germany of 46/50 Krausen-
strasse, Hannover 3, Germany, do hereby
declare the invention, for which we pray
that a patent may be granted to us, and
the method by which it is to be performed,
to be particularly described in and by the
following statement:—

This invention relates to the manufac-
ture of packs containing pre-cooked potatoes.

For preserving cooked potatoes, the deep-
freezing process is unsuitable since the
potatoes are consumed almost daily in the
household, as a fundamental and essential
food stuff, and must therefore also be readily
available for preparation of meals, this being
a possibility which is not afforded by deep
freezing due to the time required for thawing
and heating. A still more important factor
is, however, that due to the freezing process
starch contained in the potatoes is converted
to sugar and in this way the flavour of
the potatoes is greatly impaired.

For this reason, other processes have been
used such as permit storage of the cooked
potatoes at temperatures up to a few degrees
above freezing point, so that storage in stan-
dard domestic refrigerators or even in other
cool places becomes possible. At such tem-
perature, however, foodstuffs deteriorate very
much more rapidly in the cooked condition
than they do in the raw condition. Thus, it
has hitherto not proved possible to achieve a
preservation duration such as would guarantee
that the goods will reach the consumer with-
out undesirably large losses and, once having
reached the consumer, will also remain cap-
able of being stored for an adequately long
period of time.

In a known process, the potatoes which
have been peeled—if so required in the pre-
sence of steam—are cooked, refrigerated and
packed in the water-tight condition, process-
ing of the potatoes with chemical agents

being effected before cooking. Thus, the
peeled potatoes are immersed in an aqueous
solution of a sulphite or in an aqueous
sodium hypochlorite solution, for the purpose
of preventing any change in the colour of the
potatoes under the action of air. Furthermore,
the potatoes to be cooked are treated with a
disinfecting or preserving agent, in order to
keep the total number of germs in the cooked
and packed potatoes below a predetermined
value.

Apart from the fact that, for this process,
a durability of only 14 days on storing at a
temperature of lower than +5°C and only 4
days at a temperature of approximately 15°C
is guaranteed, experience shows that the con-
sumer hesitates to buy foodstuffs of which he
knows (due to the obligation to mark such
foodstuffs) that they have been chemically
treated, even if it can be proved that what
are concerned are agents which are not harm-
ful to the health. Apart from this, no such
commercially conventional agent is known
which is able to destroy decay-producing
spores.

Among the spore-formers there must be
reckoned *inter alia* the aerobic soil bacteria
which, substantially, are able to live and
develop only where oxygen is available, de-
velopment being especially assisted if the
infected foodstuff is subjected to tempera-
tures between 20 and 40°C (optimum
approximately 30°C). It has been ascertained
that with the low-degree sterilising treatment
afforded by steam-peeling resistant spore
groups of this kind can by no means be
destroyed. During the manufacturing process,
they develop further and in this way greatly
diminish the duration of preservation.

Apart from the spores, in rare cases also
infection with dangerous, anaerobic botulism
bacteria (anaerobic spore-formers exhibiting a
high degree of resistance to heat) is possible,
and these bacteria may develop under exclu-
sion of oxygen, so that they may find suitable
conditions for development when vacuum-

packing is effected in foils which are impermeable to oxygen.

The invention is based on the problem of how to achieve a process for the manufacture of packs containing pre-cooked potatoes, whereby a considerable increase in the preserving duration may be achieved, without using chemical agents, the said process being distinguished by the fact that it is extremely economical and also permits a high output.

According to the present invention, there is provided a process for the manufacture of packs of dry pre-cooked potatoes, wherein in a continuous operation cycle the potatoes are firstly peeled, and are then vacuum-packed in foil packs and pre-cooked by being heated in the packs, characterised in that before the packing the peeled potatoes are subjected to an intensive heat treatment in a hot gas or steam atmosphere until a thin surface layer of each potato has assumed a temperature of substantially 120°C.

An important factor of the invention consists in that the preparation of the potatoes has to take place "in one operation", from the starting condition up to the last process step whereby the pack is obtained ready-for-sale, each individual process step taking place under conditions which to a considerable extent prevent, from the outset, any coming into being or propagation of organisms producing deterioration.

In the preferred process, the first step in this direction is taken in a steam-peeling plant into which the potatoes are introduced, after having been pre-sorted according to size and subjected to pre-washing, and where they are processed with high-pressure steam at 7 atmospheres above atmospheric under heat radiation at approximately 130–140°C. The times of stay within the steam-peeling installation are between 15 and 30 seconds depending on the state or quality. After this short steam and heat "shock", the outer skin or peel of the potato is "burst off", the high temperature simultaneously providing for the destruction of the heat-unstable germs always present on the surface of the potatoes. The peeled potatoes pass, after leaving the steam-peeling plant, via a station wherein post-washing is effected, to a testing device which tests the result of the peeling operation, by electronic and preferably photoelectrical means, and automatically separates from the good potatoes those potatoes which still contain defects such as for example eyes, damaged portions or peel residues. The sorted-out potatoes are preferably once again introduced into the steam-peeling installation wherein appropriate further processing is effected.

Tests have shown that the zone in which the bacteria are able to develop and in which their presence may be shown in the potatoes

has a depth of only a few millimetres. For this reason, the steam-peeling process is followed, as an essential step of the process according to the invention, by a process whereby the potatoes are intensively heated, thus ensuring that the zone in which bacteria may be present is reliably subjected to heating to such an extent that the bacteria are destroyed therein. For this purpose, hot air at a temperature of at least 130°C (maximum 800°C and preferably about 400°C) is blown on to the potatoes at a flow velocity of between 1 and 8 m/sec. At the same time, the external conditions must be so selected that a temperature of approximately 120°C down to a depth of 10 to 12 mm. into the potato is attained. It has been found to be expedient to rotate the potatoes in the impinging hot air during this heat treatment, so as to avoid burning. Due to the rotation, the result is achieved that the potatoes are acted-upon by the flow of hot air on all sides. In order to prevent the potatoes from burning at the high temperature, it is furthermore expedient to mix steam with the hot air. The time during which the heat is allowed to act on the potatoes ranges between 5 and 20 minutes. The value of the process parameters are to be adapted in each particular case to the product to be processed, since these values depend on the type of potato, the season, the "year" of the potatoes, storage before processing, the composition of the potatoes, the area in which they were cultivated, and also the peeling process. The penetration depth of the necessary temperature may readily be ascertained by means of heat-sensors. Furthermore, the penetration depth may be perceived also optically due to a change in the colour of the potato substance.

After this intensive heat treatment, the potatoes pass to the packing station where they are packed, vacuum-tight, in foil by means of a deep-drawing process. Also this process is effected fully automatically under almost germ-free conditions. Following thereon, the packed potatoes are then subjected to the process whereby they are finally fully cooked.

The intensive heat treatment before packing in combination with maintenance of freedom from germs up to packing has a series of advantages. Thus, the potato exhibits a relatively high degree of heat-permeability after this heat treatment, whereby it becomes possible to effect the process whereby they are finally fully cooked in a ready manner. Furthermore, the said process resulting in the potatoes being fully cooked may be effected at a temperature of slightly below 100°C. As a rule, for reasons connected with the killing of germs, the cooking process has hitherto been effected at temperatures above 100°C. At these high temperatures, a reac-

tion is set up between carbohydrates and amino acids (the so-called Maillard reaction) which results in brown discoloration of the potatoes. Furthermore, this temperature involves impairment of digestability, a diminution in the nutrient value and a loss of vitamin C. It was furthermore surprisingly ascertained that as a result of the heat treatment before packing the finished product exhibits practically speaking no water-exuding property and no starch loss whatsoever, so that in contradistinction to all hitherto known processes the potatoes remain dry and retain their natural colour even after relatively long storage in the pack. This preservation of the attractive appearance of the product is decisive factor for sales success. Finally, the process according to the invention makes it possible to dispense with refrigeration and therewith with costly refrigeration systems of conventional type. In the case of the process according to the invention, cooling may be effected in the ambient temperature available or cooling in a water bath will suffice, so as not to unnecessarily prolong the process.

An installation for the performance of the process according to the invention is shown, by way of example, in the accompanying drawing.

From the potato bunker 1, the potatoes travel via a sorting installation 2, into the steam-peeling plant 3 wherein pre-washing is effected prior to steam-peeling and post-washing is effected subsequent to steam-peeling. The steam-peeled potatoes then pass through a testing device 4 wherein they are tested for defective portions by photoelectrical means. Not entirely satisfactory potatoes are sorted-out and returned to the steam-peeling plant 3. Only entirely satisfactory potatoes then pass into a rotating drum 5 which may be designed in the manner of a basket and in which the intensive heat treatment is effected. From there, the potatoes pass to the weighing device 6 in which the quantities required for packing are separated-off. The weighed potato portions are then fed to a vacuum deep-drawing automatic machine 7 in which they are packed air-tight in foil. In the following arrangement 8 in which the potatoes are brought to the condition in which they are fully cooked, the potatoes are heated-up and brought to the fully cooked condition in saturated steam. After being brought to such a completely cooked condition, the potatoes may travel through a cooling tunnel 9 and, finally, reach the automatic packing machine 10 which issues the product ready-for-sale.

Thus, the entire production is effected fully automatically without any kind of manual labour. Tests have shown that the product

is, at the end of the manufacturing line, in a sterile condition such that it remains preserved for a period of time which is longer by several orders of magnitude than hitherto achievable with hitherto known processes. The potato packs extracted from the manufacturing line before travelling through the cooling tunnel were stored for 14 days in an incubator at a temperature of $+30^{\circ}\text{C}$, i.e. at an optimum temperature for spore formation, without the durability thereof suffering.

For potatoes of the Clivia type, harvested in July 1969 in the cultivation area of Lower Saxony, 48 hours old and having a starch content of approximately 11%, the following process conditions have been found to be satisfactory in practice: temperature of the hot air introduced into the drum 5: approximately 380°C ; velocity of flow of the hot air: 4 to 5 m/sec; diameter of the drum: 30 cm; speed of rotation of the drum: 10 to 12 r.p.m.; time of stay in the drum: 13 minutes; time for fully cooking with the oven heated-up: 25 minutes.

WHAT WE CLAIM IS:—

1. Process for the manufacture of packs of dry, pre-cooked potatoes, wherein in a continuous operation cycle the potatoes are firstly peeled, and are then vacuum-packed in foil packs and pre-cooked by being heated in the packs, characterised in that before the packing the peeled potatoes are subjected to an intensive heat treatment in a hot gas or steam atmosphere until a thin surface layer of each potato has assumed a temperature of substantially 120°C .

2. Process according to claim 1, wherein the intensive heat treatment is effected with flowing hot air having a temperature of at least 130°C , at most 800°C , and preferably about 400°C .

3. Process according to claim 2, wherein the flow velocity of the hot air is 1 to 8 m/sec.

4. Process according to claim 3, wherein the hot air has atmospheric steam mixed with it.

5. Process according to any one of the preceding claims, wherein the potatoes are, for the intensive heat treatment, introduced into a rotating drum.

6. Process according to claim 5, wherein the time of stay of the potatoes in the drum is 5 to 20 minutes.

7. Process according to any one of the preceding claims, wherein the temperature of the hot air, the flow velocity thereof, the quantity of steam, the rotation velocity of the drum and the time of stay are so selected that a temperature of approximately 120°C down to a depth of 10 to 12 mm is established in the potatoes.

8. Process according to any one of the preceding claims, for the manufacture of packs containing steam-peeled pre-cooked potatoes substantially as described herein.

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Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1972.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from
which copies may be obtained.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*

